Conference Paper prepared for presentation at the 40th Annual Meeting of the European Regional Science Association, Barcelona, Spain, 29th of August - 1st of September 2000

DETERMINANTS OF MARKET AREA SIZE OF PRODUCTION PLANTS AND SERVICE PROVIDERS

- Empirical evidence from Sweden applied to a general spatial equilibrium market model

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Abstract

The purpose of the present paper is to study, in cross-sections of industries - both manufacturers and service providers - how market area size depends on the interplay of transport and production costs and the spatial structure of demand.

A quantitative spatial model of market equilibrium has been developed and tested empirically on a sample of manufacturing and service industries in Sweden. The empirical results are much in line with those predicted by the model. The:

- larger the density of demand is , the smaller the market area size will be
- greater economies-of-scale in production are, the larger the market area size will be
- higher the transport costs of inputs/outputs are, the smaller the market area size will be

Interestingly, these results are well in line with what has been found in empirical studies of manufacturing industries in the USA, using a similar model, see Wall (2000).

1 INTRODUCTION

This paper contains empirical results that will be included in my forthcoming thesis, Wall (2001). The overall purpose of the thesis project is to study, longitudinally as well as in cross-sections, how the structure of transport costs affects the market area and market form in different industries. The thesis project also examines how the conditions of competition (which is another facet of the same thing) depend on the interplay of transport costs, production costs, and the spatial structure of demand. A quantitative, spatial model of market equilibrium within different industries, focusing on the structure of transport costs, has been developed and tested empirically on data gathered for the most part in Sweden and the USA. The goal of the present paper, however, is somewhat narrower.

2 DO TRANSPORT COSTS MATTER?

Economists often argue that transportation costs have historically had a strong influence on where a firm locates, but that this influence today, when transport costs often constitute no more than a few percent of a product's value, is quite modest. Furthermore they argue that:

> The economy's continuing shift away from heavy manufacturing toward production of high-value commodities, personal service, and more recently, information-based products reduces the number of firms facing substantial costs for shipping raw materials or finished products ...

Pickrell (1999), p. 417

If this is true, one may question the relevance of transport costs analyses for market area sizes of production plants and service providers. Take a look at the six maps comprising Figure 1 on next page. Displayed are the locations of dairies in business in Skåne (the southernmost province of Sweden) for the years 1944, 1954, 1964, 1974, 1984, and 1994.

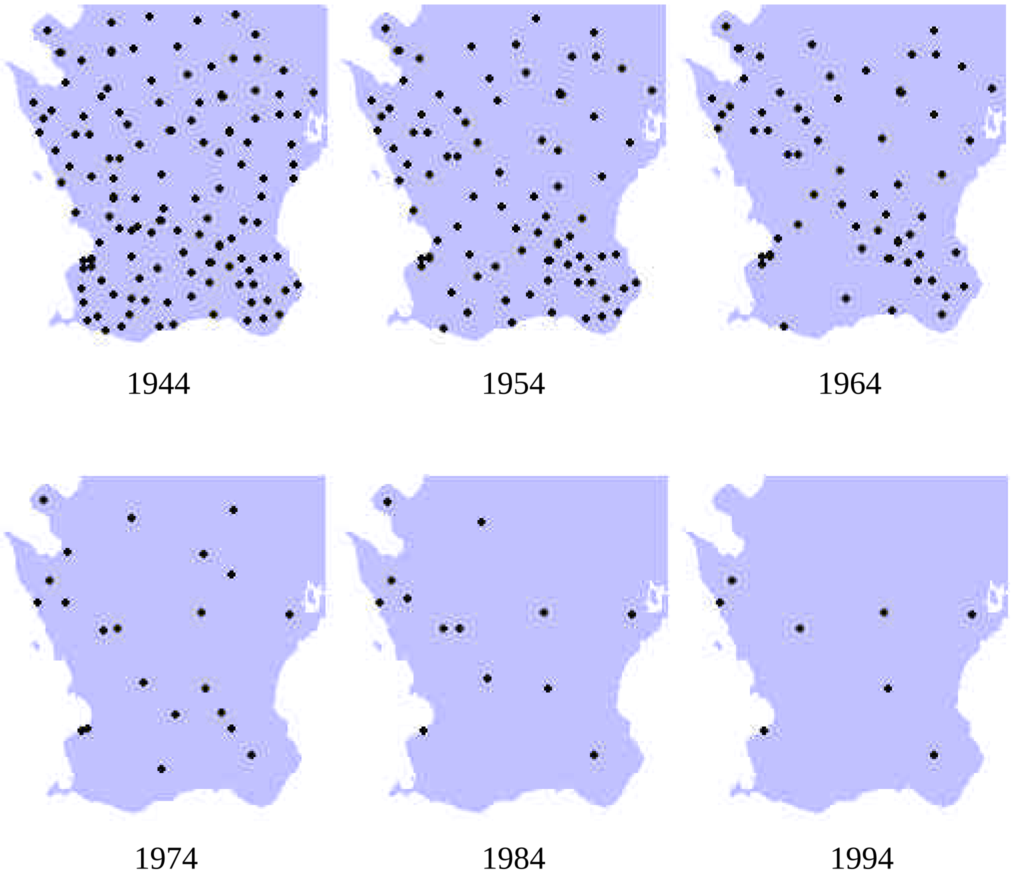

Figure 1: Dairies in Skåne at 10-year intervals 1944 - 1994

Source: Based on Sveriges NationalAtlas (1995), p. 43

The number of dairies in business has been substantially reduced during the 50-year time span 1944-1994. A closer look reveals that there exists a geographical balance to the closing of the dairies. The dairy industry consists mainly of profit-maximizing firms, and one would expect to find an explanation for the change in the number and location of the dairies, or - which is another facet of the same thing - the increased market area size of the plants, as shown in Figure 1. Among other possible determinants are the following are immediate candidates:

- increased specialization and utilization of scale-economies in production
- reduced transportation costs
- changes in geographical structure and density in demand
  (that is; the migration from the rural areas to the cities)

The first two are, of course, nothing but the standard transport- and production cost trade-off encountered in virtually all spatial models in this branch. This trade-off has been well recognized at least since the publication of *Wealth of Nations* (1776) by Adam Smith. The last factor is often included as an argument in such models as well.

In the model to be outlined below a fourth argument will be added. Examine Figures 2a and 2b below, which show the location of automobile assembly plants in Sweden in 1999 (there are only three: one in Gothenburg, one in Uddevalla [Volvo], and one in Trollhättan [SAAB]) and the location of the paper/pulp mills in Sweden in 1989, respectively. A few of the paper/pulp mills have since closed, but still it is obvious that there exists a much larger number of pulp/paper mills in Sweden automobile assembly plants.

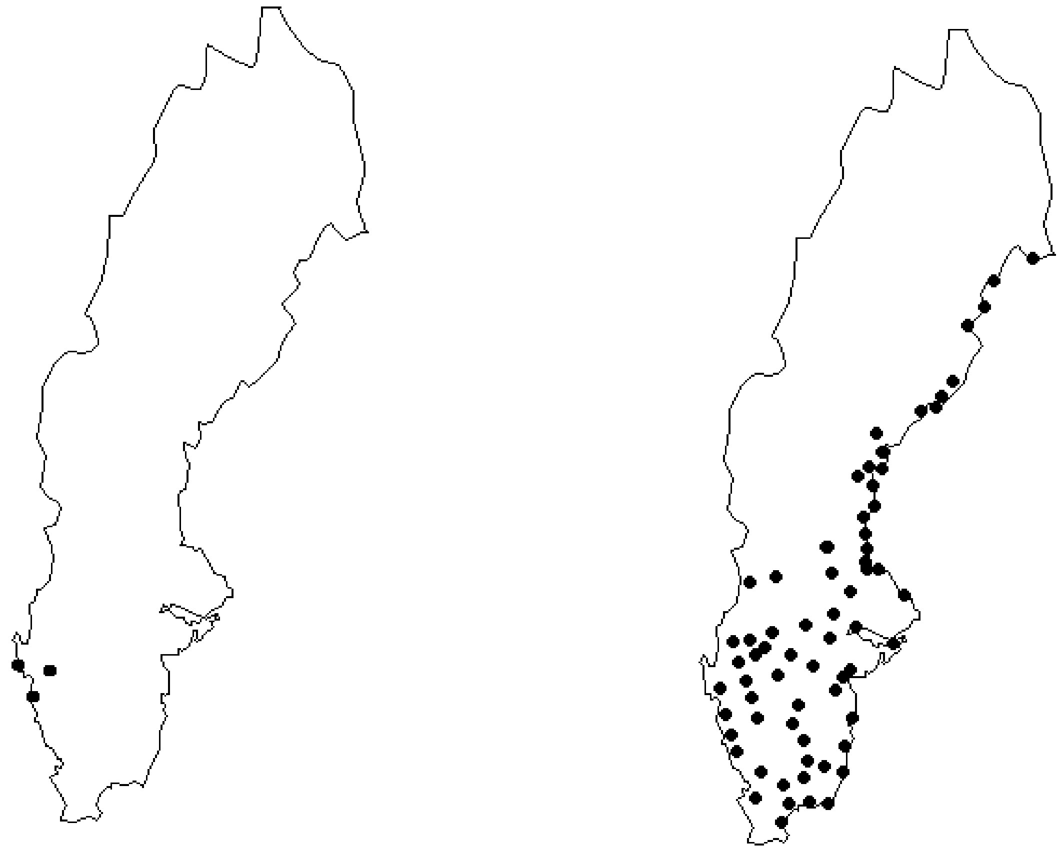

Figure 2a: Automobile assembly plants in Sweden 1999
Source: VOLVO and SAAB

Figure 2b: Paper/pulp mills in Sweden 1989
Source: Based on Rydberg (1990), p. 132

One difference between these two industries can be found by comparing commodity values, automobiles vs. paper/pulp, per ton. The former amounts to some 100,000 SEK per ton (the mill price of a typical VOLVO automobile is approximately 150,000 SEK and its weight is approximately 1.5 ton), while the value per ton of paper/pulp amounts to an average of just 5,000 SEK (the mill price of paper/pulp is much more volatile than is the price of a VOLVO, but this is of little importance in the present context, as even after a doubling or a halving of the paper/pulp price, the ”per ton-price” of a VOLVO is still much higher). These observations provide motivation for the including of the unit-value per ton of the commodities as a possible determinant for explaining market area sizes.

It may be argued that it is misleading to display only plants in Sweden. However, a map of the world would display very much the same pattern: that more paper/pulp mills exist than do automobile assembly plants. Furthermore, maps displaying a wide variety in the number of plants between different industries within a given area in a particular year, could be constructed from cross-section data form those industries.

Examine Figures 3a and 3b on next page, which display the location of vacuum cleaner manufacturing plants and cleaning firms in Linköping (a city of some 100,000 inhabitants located in southern of Sweden), respectively. There are no vacuum cleaner manufacturing plants at all in Linköping (there are only two in the whole of Sweden), but no less than 16 cleaning firms there. Why is that so? One important reason is that cleaning firms provide services require the employees to travel to the customer’s location (and this is quite a costly matter), whereas vacuum cleaners can be shipped from the plant far away, even abroad, fairly inexpensively. This indicates that a shift from goods to service production in the economy does not diminish the influence of transportation costs on the location of economic activities.

By now three sets of maps have been exposed – one time-series, one cross-section of manufacturing, and one cross-section comparison of manufacturing and service production. These maps also suggest that transportation costs, of goods and/or people, still matter.

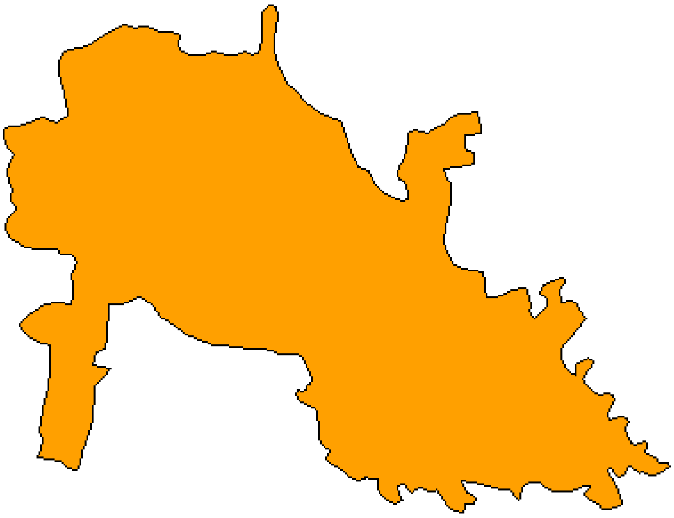

Figure 3a: Vacuum cleaner manufacturing plants in Linköping in 2000

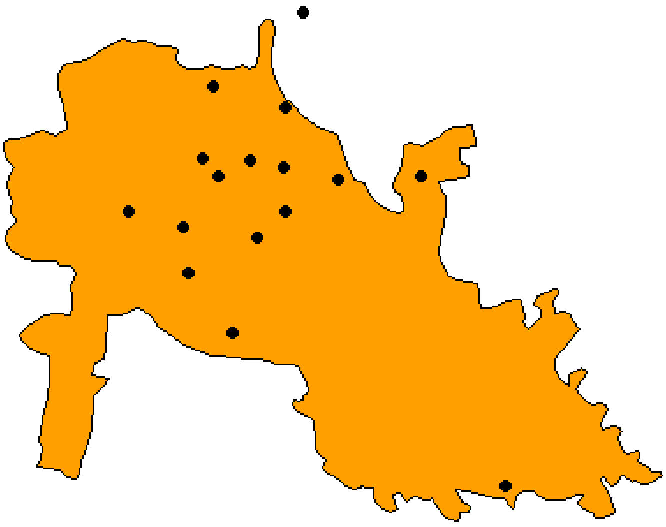

Figure 3b: Cleaning firms in Linköping in 2000

How can differences in plant location patterns over time and between industries be modeled? The question is not a new one. As mentioned previously, this and similar problems have been studied by geographers and economists at least since the days of Adam Smith. Other early contributors in this field of research are von Thünen (1910 [1826]), Lardner, (1850), Launhardt (1885), Weber (1929 [1909]), Christaller (1966 [1933]), Pallander (1935), and Lösch (1954 [1940]). More recent work include Isard (1956), Moses (1958), Greenhut (1956, 1963, and 1987), Beckmann (1968), and Fujita, Krugman & Venables (1999).

3 THE PURPOSE OF THE STUDY

What are the benefits of possessing qualitative and quantitative information about the forces behind market area size and its contraction/expansion? Take, for example, changes in transport costs. One field of application may be as one of several inputs in a Cost-Benefit Analyses CBA when profitability calculations of infrastructure investments must be made. If, for example, lowered transport costs promote increased centralization and specialization in the industry, then real resources are likely to be saved in the economy, since fewer plants/service providers could be used to produce the same amount of goods/services. For more on the ”Industrial Reorganization” effects of changed transport costs, see e.g. Mohring & Williamson (1969).

The purpose of this paper is to study the effects of transport costs on the market area size of service providers. In order to do so a general quantitative, spatial model of market equilibrium has been developed. The model has four arguments, and by empirical testing an attempt is made to deduce the qualitative effect imposed by the derived determinants, and to estimate these effects quantitatively. A sample of manufacturing and services industries in Sweden comprise the empirical evidence (which may have some relevance for other industries, regions, or even countries).

4 A BRIEF OUTLINE OF THE MODEL

The complete derivation of the spatial equilibrium model is quite lengthy, and will appear in full in the forthcoming thesis (the derivation, of course, can be provided by the author upon request). Following is a brief summary of the core of the model, which has most relevance for the present study. It should be noted that the model is equally applicable to goods manufacturing as to service-providing industries.

Consider an industry that produces a homogeneous product which is consumed troughout the prespecified area (a region, country etc) according to a pattern that makes the density of demand approximately uniform. Suppose also that the total demand per square km for the product is completely inelastic. The plants are assumed to face the same linear Total Cost TC function:

$$TC = F + MC \cdot Q \qquad (1)$$

where

F = Fixed costs
MC = Marginal costs
Q = Quantity produced

Firms are furthermore assumed to sell free-on-board, that is, the consumers bear all costs of transport. (This assumption makes it also natural to disregard the issue of spatial price discrimination). The average transport cost is assumed to increase with increases in the market area size of each particular plant. On the further assumption that all factors of production are available at a given price all over the geographical area in question, it follows that profit-maximizing, single-plant firms and social welfare maximizers (which are the categories encountered in the empirical part below) tend to spread evenly throughout the area. The individual market areas are assumed to take the shape of equally sized, non-overlapping hexagons.

The structure outlined above can be reduced to a relationship that resembles the Weber problem [for an introduction into the Weber problem, see e.g. Beckman (1968), pp. 15-21 or Puu (1996), pp. 5-9]. The market area **M** of a production facility is assumed to be a function of the unit-value **a** (that is; the value per ton or m^3, or per service provided) of the product in question, the degree of economies-of-scale in production **b**, the transport cost per km of a unit of output (or the transportation of the service provider or buyer) **c**, and the density of demand **d**. Thus:

$$\mathbf{M^*} = f(\mathbf{a}, \mathbf{b}, \mathbf{c}, \mathbf{d}) \qquad (2)$$

$$\partial \mathbf{M^*}/\partial \mathbf{a} > 0, \quad \partial \mathbf{M^*}/\partial \mathbf{b} > 0, \quad \partial \mathbf{M^*}/\partial \mathbf{c} < 0, \quad \partial \mathbf{M^*}/\partial \mathbf{d} < 0$$

where

M* = size of market area in equilibrium
a = unit value of the product
b = a measure of the degree of economies-of-scale in production
c = transport cost per passenger/ton-km of a unit of output
d = density of demand per square km

A high unit-value **a** can, ceteris paribus, be expected to be related to a larger market area. For example, watches are easily shipped world-wide, whereas cement usually is shipped within a much more local area. High transport costs **c**, on the other hand, can be expected to constitute a contracting force on the size of the market area. Given the location of a particular production facility, buyers far away may not be supplied at a (production cost + transport cost =) total cost below their reservation price. A high value of **b** means that it is scope for utilization of large-scale advantages in production. Given the density of demand, a larger production volume can be expected to generate a pull outwards on the boundaries of the market area. On the other hand, in an area with a high density of demand the scope for utilization of large scale advantages in production will be exhausted within a smaller market area than where the density of demand is low. Therefore, **d** can be expected to exert a contracting force upon the size of the market area.

Given the quite strict assumptions presented in this section, the following explicit formulas for **M*** can be derived:

Profit-maximizer: $$\mathbf{M^*} = (12)^{1/6}(\mathbf{a}/\mathbf{c})^{2/3}(\mathbf{b}/\mathbf{d})^{2/3} \tag{3a}$$

Social welfare maximizer: $$\mathbf{M^*} = (2/K)^{2/3}(\mathbf{a}/\mathbf{c})^{2/3}(\mathbf{b}/\mathbf{d})^{2/3} \tag{3b}$$

$$K = \frac{2\sqrt{3}+1}{3\sqrt{3}\sqrt{2\sqrt{3}}}$$

Since these assumptions rarely will hold in any market observed, the expressions (3) should be regarded as special cases. The formula, however, may warrant the use of a multiplicative model:

$$\mathbf{M^*} = C(\mathbf{a}/\mathbf{c})^{\omega}(\mathbf{b}/\mathbf{d})^{\varphi} \tag{4}$$

as well as a multiplicative formulation of the model (2) where the explanatory variables in the ratios of model (4) have been split and appear separated:

$$\mathbf{M}^* = f(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) = C\mathbf{a}_i^{\alpha}\mathbf{b}_i^{\beta}\mathbf{c}_i^{\gamma}\mathbf{d}_i^{\phi} \tag{5}$$

in the regressions to follow.

5 MARKET AREA OF THE TYPICAL FIRM AS THE INVERSE OF THE NUMBER OF FIRMS IN A PARTICULAR MARKET

In Figures 1-3 no demarcation of market areas for the production facilities in question were visible on the maps. This is, unfortunately, often the situation with which one is confronted in empirical investigations. However, provided that:

- the plants are somewhat evenly spread throughout the geographical area
- market areas do not overlap
- no export outside the area of study takes place

the market area **M** of the average (or typical) firm can be estimated as the (in some way geographically delimited) total market area size **A** divided by the number n of (single plant/service providing) firms located within this same area **A**. That is:

$$\mathbf{M} = \mathbf{A}/n \qquad (6)$$

Since the requirements above often do not hold perfectly, formula (6) introduces biases in the estimations to follow. However, the sets of maps in Figures 1-3 suggest that a larger number of firms in a particular area indicates a smaller market area of the average firm than does a smaller number of firms. Therefore, formula (6) provides an approximation method that will be used repeatedly in the sequel. [There are, of course, other approaches to find solutions in situations like this one, see e.g. Simons (1974)].

6 THE GENERALIZED COST

For the transportation of goods, the freight rate charged by a hauling company may serve as a reasonable approximation of the transport cost **c**. However, when transportation of people is involved as when employees must travel to a client site or clients must travel to the service provider, is involved, the spare monetary price appears insufficient due to the unaccounted costs such as that incurred in travel time. To deal with such discrepancies (and others) the concept of Generalized Cost GC has been developed.

The total cost of a transportation activity usually is only partially measured by financial cost, since often other cost items are involved as well. These may include money costs, time costs, inconvenience costs and so on. An indexation is needed, preferably expressed in monetary terms, of the overall possible cost of transportation. This can be obtained by the Generalized Cost defined as:

$$GC = g(c_1, c_2, \ldots, c_n) \tag{7}$$

where GC is Generalized Cost and $c_1, c_2, \ldots, c_n$ are the various money, time and other costs of transport. In a more detailed analysis the components are divided into a number of elements. The time component may be divided into walking time, waiting time, on-vehicle time, etc. Sometimes there is no need for such a breakdown. In fact, it may be advantageous to simply separate the money costs from all other cost components of transportation. Such an operation results in an expression of the Generalized Cost in general form:

$$GC = \Sigma M_i + \Sigma T_j t_j \tag{8}$$

where M_i are actual money costs, T_j represents all other ”costs” of transportation and t_j are the monetary values per unit of these components. For a somewhat broader introduction into this subject, see e.g. Button (1992), pp. 85-89.

7 EMPIRICAL STUDIES

The empirical studies amount to determining numerical values for the $\mathbf{M}_i$:s, $\mathbf{a}_i$:s, $\mathbf{b}_i$:s, $\mathbf{c}_i$:s, and $\mathbf{d}_i$:s for the selected industries. These are grouped into two categories, manufacturing and service production in Sweden, below. Both will be analyzed on the basis of the models (4) and (5).

7.1 Manufacturing

The empirical evidence in manufacturing is gathered from the following industries:

- the Swedish market for petrol, which can be studied in two steps and thus yield two observations:
  1) the link petrol depots (plants) – filling stations (buyers) in 1996
  2) the link filling stations (plants) – motorists (buyers) in 1996
- pizza catering in Hannover, Germany, in 1998
- the bakery industry in Sweden in 1998-1999
- grocery stores in Linköping in 1997
- the Swedish sugar industry in 1938
- the market for firs in Linköping in 1999

How the Data was Obtained

The approaches to gathering data for these industries have varied. The study of the Swedish sugar industry is based on archival research, and the petrol studies are based on very detailed surveys, which yielded quite reliable data. The study of the link between petrol depots and filling stations is reported in Wall (1998).

For the other industries in the sample the data-collecting process for the bakery industry may serve as a representative example. A single-plant firm located in the eastern part of the country was chosen as the point-of-departure, and the managing director of the firm kindly accepted upon a personal meeting in September 1998. At his office he offered the following information:

- The firms operated their own transportation of bread and other bakery goods to the customers, the retailers.
- The maximum radius of a lorry transportation is X km, giving an approximate market area M of X km^2.
- The average value free-on-board of a ton of the firms products, as well as the average load in kilograms of a lorry.

In addition, the managing director offered some insights on the operation of a relatively small single-plant bakery versus the large multi-plant bakery firms covering the whole of Sweden. There is a trade-off between the size of the bakeries and transportation costs. The delivery price to the retail store must be somewhat equal. In a small bakery the production process is heavily dependent on man power, which is quite expensive per unit weight of the bakery goods; there is little room for additional transportation charge, meaning that the goods can not be transported very far. Thus, the small bakery has a small market area. The large bakeries make extensive use of machines, allowing for low-priced bakery goods free-on-board; there is consequently more room for transportation mark-ups. Large bakeries, therefore, are able to ship their products two, or even three, times the distance of what the small bakeries do.

As firms are willing to share their accounting data one must be satisfied with this relatively generous information. The market area **M** of a small bakery was availible, as was the value per ton of the goods in question **a**. From sources, such as the InterNet and the Swedish Industry Calendar, a dozen single-plant bakeries were identified. An introductory letter was sent to each of these, followed by a personal telephone call; the only question that was asked concerned the yearly production volume in tons. Virtually all of the firms were willing to give out the information. The annual financial reports of the bakeries were ordered from the Swedish Patent and Registration Office (PRV). With total cost and total production data for about a dozen firms/plants it was easy to deduce the cost function, as defined by (1), in the (small) bakery industry studied here, as well as the measure of **b**, as defined by F/MC. [This definition deviates somewhat from the widely-used measure of economies-of-scale, s=AC/MC, where AC is Average Costs, as e.g. in Baumol, Panzar & Willig (1982), p. 21. From the full derivation of the model it can be understood why the definition F/MC is more appropriate in the present context]. From yet another bakery information was obtained on the cost per km of operating a bakery-goods lorry of the typical size and construction. Together with the information about the average load of the lorries, as obtained from the manager of the small bakery an approximation of **c** now was possible. Finally, the density of demand **d** was calculated as the total production divided by the market area in km^2. In this way average, or typical, data for **M**, **a**, **b**, **c**, and **d** have been obtained for the bakery industry in Sweden. Data for the remaining observations have been obtained in a manner much like the one described above; it seems unnecessary to repeat such overviews.

The Regression Results

Using the data described above, the point-of-departure is the model (4). The linearized regression model becomes:

$$\ln\mathbf{M}_i = \ln C + \omega\ln\left(\frac{a}{c}\right)_i + \varphi\ln\left(\frac{b}{d}\right)_i + \varepsilon_i \qquad (9)$$

where

$\mathbf{M}_i$ = size of the market area for a typical plant in industry i

$\left(\frac{a}{c}\right)_i$ = the value per ton of the commodity in question relative to the transport cost per ton-km in industry i

$\left(\frac{b}{d}\right)_i$ = a measure of the degree of economies-of-scale in production relative to the demand per km^2 in industry i

ε_i = error term

C, ω, φ = a constant and parameters to be estimated

A regression including two explanatory variables and only seven observations may give rise to some hesitation, but this is the result (t-values in parenthesis):

$$\ln\mathbf{M} = \underset{(0.05)}{0.03} + \underset{(3.40)}{0.62}\ln\left(\frac{a}{c}\right) + \underset{(4.63)}{0.52}\ln\left(\frac{b}{d}\right) \qquad R^2(\text{adj}) = 0.96 \qquad (10)$$

Equation (10) certainly is a nice result. The degree of explanation extremely high, 96%. Both coefficients have the right sign, and are significantly different from zero. Furthermore, the coefficients, 0.62 and 0.52, are quite close to 2/3, which was the prediction of the special case, model (3).

In the next step the ratios are split and a regression is done on these seven observations on the four-variable linearized multiplicative model (5). Technically, with four explanatory variables six observations is the absolute minimum. The result is (t-values in parenthesis):

$$\mathbf{M} = 1.02 + 0.61\ln\mathbf{a} + 0.41\ln\mathbf{b} - 0.69\ln\mathbf{c} - 0.54\ln\mathbf{d} \qquad R^2(adj)=0.93 \tag{12}$$
$$(0.21)\quad(1.01)\qquad(1.58)\qquad(-2.34)\qquad(-3.44)$$

The degree of explanation is high, 0.93. All four of the coefficients have the expected sign, although just one is significantly different from zero (with just 3 degrees of freedom the relevant t-value is 3.18). It is also encouraging that equation (12) seems to yield a decent estimate of the market area response for changes in the transportation costs.

7.2 The Service Industries

As mentioned above, the model outlined in Section 4 is equally applicable to services industries an goods industries. The major difference is in the change of the unit of measurement; for transport costs **c** from ton-km or m^3-km to person-km (as described in Section 6). The following sample of service providers (most of which are located in the Linköping area) are included in the study:

- Lawyer's offices
- Hair salons
- Driving schools
- Nine-year compulsory schools
- Upper secondary schools
- Primary Health Centers

Since the average values **M**, **a**, **b**, **c**, **d** for each industry constitute one observation this data base amounts to a mere six observations. However, service providers often run small-scale business. Therefore, one finds a great number of them in a given area. For example, there were some 130 hair salons in the county of Linköping, Sweden, in 1999. There were 86 salons inside the city of Linköping (denoted I in the sequel), an additional 27 salons in the suburbs (II), and 15 in the rural area surrounding the city (III). The service providers so grouped display different characteristics with respect to the assumed determinants of market area, not the least of which is the transport costs per person-km. Thus, by so grouping the hair salons, the Nine-year compulsory schools and the Primary Health Centers, a total of twelve observations were obtained, all of which give different values for the explanatory variables.

How the Data was Obtained

The $\mathbf{M}_i$:s, market area sizes

In Section 5 a method was outlined for obtaining the market areas **M** of the service providers where no demarcation is apparent. This method has been used for all of the industries above, except for the Primary Health Centers and Nine-years compulsory schools, where authorities have provided relevant market (or, rather in this case: recipient) areas. Some of the industries in this sample do not meet the requirements of Section 5. However, the number of service providers vary widely indicating that the method may give a reasonable idea of the relevant market area sizes. The number of service providers within the observatory units are:

Industry	Number of service providers
Lawyer’s offices	14
Hair salons I	86
“ “ II	27
“ “ III	15
Driving schools	6
Upper secondary schools	4

The $\mathbf{a}_i$:s, $\mathbf{b}_i$:s, $\mathbf{c}_i$:s, and $\mathbf{d}_i$:s

The approaches for obtaining data for the services providers included in the sample was similar to that described for the bakery industry, and will not be repeated here.

The Regression Results

Taking the input data described above into account the point-of-departure is the model (4). The linearized regression includes two explanatory variables and twelve observations, and the result is (t-values in parentheses):

$$\ln\mathbf{M} = \underset{(2.38)}{0.24} + \underset{(0.60)}{0.22}\ln\left(\frac{a}{c}\right) + \underset{(6.37)}{0.79}\ln\left(\frac{b}{d}\right) \qquad R^2(\text{adj}) = 0.90 \qquad (11)$$

Equation (11) give us another nice result. The degree of explanation is high, 90%. Both coefficients have the right sign, although only the ratio **b**/**d** is significantly different from zero. The coefficients, 0.22 and 0.79, deviate from those predicted by the model (3), which were 2/3. They are, however, roughly within the same magnitude.

It is also possible here to separate the numerator and denominator in the ratios, and obtain the linearized multiplicative regression model with four explanatory variables: The result is (t-values in parentheses):

$$\mathbf{M} = \underset{(1.07)}{3.13} + \underset{(1.06)}{0.31}\ln\mathbf{a} + \underset{(3.30)}{0.73}\ln\mathbf{b} - \underset{(-2.93)}{2.93}\ln\mathbf{c} - \underset{(-4.07)}{0.54}\ln\mathbf{d} \qquad R^2(\text{adj})=0.92 \qquad (12)$$

The degree of explanation in (12) is high, 0.92. All four coefficients have the expected sign, and all but one, **a**, are significantly different from zero.

The high t-value for the density of demand **d** should not be surprising, given that the sample contains several public-service providers (health care and schools), and it is a policy in Sweden to locate such services close to where people live. The high coefficient for transport cost **c** should not be surprising either, given that the costs for transportation (of people) constitute a quite large fraction of the product price in the service industries.

8 CONCLUDING REMARKS

In this paper a spatial model has been outlined in an attempt to determine the qualitative, and to estimate the quantitative, impacts of some determinants of market area size of production plants or service providers. The overall conclusion is that the empirical evidence suggests support for the predictions of the model. That is:

- The larger the density of demand is , the smaller the market area size will be
- The greater economies-of-scale in production are, the larger the market area size will be
- The higher the transport costs of inputs/outputs are, the smaller the market area size will be

The results, that is: the signs and sizes of the coefficients, of the present study are much in line with those obtained from a study of manufacturing industries in the United States, Wall (2000).

Finally, it may be mentioned that the model of the present paper is applicable only to such industries in which the production facilities tend to spread out somewhat evenly throughout the geography. These kinds of industries are easily found. However, there are also industries which tend to cluster. Several factors contribute to such a plant location pattern. One factor is that economic activities tend to take place where the inputs are found. This is, of course, particularly conspicuous in agriculture, forestry, and mining. Producers/sellers may also benefit from one another's presence, e.g. concerning buyer's information. Every potential jewelry buyer in New York knows that retailers are located on the 47th Street. Sellers know that more buyers are attracted to the selection offered in the Jewelry District than are lost to jewelry sellers next by. Firms may also obtain other benefits from being located in the same vicinity. For example, the diffusion process of innovative ideas of how produce, or how to otherwise run a business, may foster clusters of similar business.

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